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Ari Van Assche, Chang Hong and Veerle Sloommaekers



Katholieke Universiteit Leuven

LICOS Centre for Institutions and Economic
Performance
Huis De Dorlodot
Deberiotstraat 34 – mailbox 3511
B-3000 Leuven
BELGIUM

TEL: +32-(0)16 32 65 98

FAX: +32-(0)16 32 65 99

<http://www.econ.kuleuven.be/licos>

China's International Competitiveness: Reassessing the Evidence*

Ari Van Assche[†]
HEC Montréal and CIRANO

Chang Hong
IMF

Veerle Sloomakers
Katholieke Universiteit Leuven

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Abstract

In this paper we argue that export data are an inadequate tool to measure a country's international competitiveness when external trade is dominated by export-processing trade. Export data do not necessarily reflect the value produced in an exporting country, but rather capture the gross value of the products that leave a country's ports. We demonstrate that, in the case of China, this leads to an upward bias in both the perceived quantitative and qualitative threats to the Western economies.

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[†] *Corresponding author.* HEC Montréal, Department of International Business, 3000 chemin de la côte-sainte-catherine, Montréal (Québec), Canada H3T-2A7. Phone : (514)340-6043. Fax: (514)340-6987.
E-mail addresses: ari.van-assche@hec.ca (A. Van Assche); CHong@imf.org (C. Hong); Veerle.Sloomakers@econ.kuleuven.be (V. Sloomakers)

1. Introduction

In recent years, Western business and political leaders have voiced concerns that China's economic rise is threatening their countries' competitiveness. They generally identify two types of threats: a quantitative and a qualitative one. First, there is a perceived *quantitative threat* related to China's stellar export performance. Since 1992, China's exports have grown at an annualized rate of 18 percent, more than twice the growth rate of world exports. As a result, its share of world exports has surpassed that of Japan to become the world's third largest after the United States and Germany. This has garnered the fear that China is eating away Western countries' market shares. Second, there is a perceived *qualitative threat* that the goods that China exports are becoming increasingly sophisticated. Where fifteen years ago China was primarily an exporter of low-tech products such as apparel, toys and footwear, today it has become the world's largest exporter of electronics products. This has caused concern that China is rapidly moving up the technology ladder and becoming competitive in areas of comparative advantage for Western economies.

These perceived threats have contributed to heightened political tensions between China and the West. In the United States, the 109th U.S. Congress introduced 27 pieces of anti-China trade legislation. And the current 110th U.S. congress introduced over a dozen in just its first three months in office (Scheve and Slaughter, 2007). Similar tensions are also arising in Europe. Of the 48 ongoing EU anti-dumping and anti-subsidy cases more than half concern China. And in 2007, all newly initiated EU anti-dumping investigations were China-related (European Commission, 2008).

The present debate over China's competitiveness is in many respects reminiscent of the worries about Japan's economic rise in the 1980s. At that time, the West was concerned of increasingly competitive Japanese firms that appeared poised to overtake the US as a leader in high-tech sectors such as the electronics and automobile industries. This time, however, there is an important difference. China's economic rise is not fueled by the emergence of Chinese world-class companies. Instead, it is largely instigated by the decisions of multinational firms to offshore their manufacturing plants to China's coastal region for export purposes. Currently, export-processing trade accounts for more than half of China's total trade.¹ And foreign-invested enterprises (wholly-owned foreign enterprises and international joint ventures) are responsible for more than half of China's exports.

In this paper, we argue that due to the large role of processing trade in China's external trade, the competitive threats coming from China seem much larger than they really are.

¹ Under China's processing trade regime, a company can import components duty free, with the caveat that the processed goods must be exported.

This is because export data do not adequately measure the value produced in an exporting country, but rather capture the gross value of the products that leave a country's ports. For a country that heavily relies on imported inputs to produce their exports, its export value thus may significantly exceed the value that it really produces in its export sector. We demonstrate that in the case of China, the large role of processing trade leads to a large upward bias in both its perceived quantitative and qualitative threats to the Western economies.

We have organized the paper as follows. In Section 2, we will use a standard measure of international competitiveness to analyze the perceived quantitative and qualitative threats that come from China. According to this measure, China is not only raising its overall international competitiveness, but it is primarily doing so in high-technology industries. In Section 3, we will highlight the problems with this standard measure and reassess China's international competitiveness. In Section 4, we discuss the implications of this biased threat. Finally, Section 5 concludes.

2. China's Competitive Performance

An often used measure of international competitiveness is a country's export market share.² A country gains (loses) international competitiveness if its export market share increases (decreases).³ In this section, we show that this measure provides seemingly compelling evidence that China is not only becoming more competitive on the international market, but it is gaining market share mainly in high-technology industries.

In the past decade, China's export performance has been exceptional. Between 1992 and 2005, its exports have grown at an annualized rate of 18.4 percent, more than twice the growth rate of world exports. As a result, China's world export share has risen from 2.4 percent in 1992 to 7.7 percent in 2005 (see Table 1). It has thus surpassed Japan to become the third largest exporter behind the United States and Germany. This has fueled

² The concept of national competitiveness remains highly controversial with economists. In his critique on the Clinton administration's flirtation with industrial policy, Krugman (1994) famously argued that "competitiveness is a meaningless word when applied to national economies. And the obsession with competitiveness is both wrong and dangerous." More recently, however, Lall (2001) and Neary (2003) have demonstrated that national competitiveness has a valid economic definition, but that it does not necessarily justify neo-mercantilist policy interventions.

³ Numerous academic studies have used this method to demonstrate the rise in China's international competitiveness. Adams *et al.* (2006) use the rise in China's share of world exports as one of their key indicators to highlight the rise of China's international competitiveness. Holst and Weiss (2004) have used this approach to demonstrate that ASEAN economies are suffering a substantial and widespread loss of market share in the US and Japanese markets due to the rise of China's exports. Similarly, Lall and Albaladejo (2004) find that China's rise in international competitiveness has primarily threatened the low-technology sectors of its East Asian neighbors.

concerns in the West that China's economic rise is threatening their competitiveness by eating away their world market share.

Table 1: World's Ten Largest Exporters in 2005

Country	Exports (US\$ million)		Export share		Growth rate
	1992	2005	1992	2005	1992-2005
Germany	429,643	976,283	12.0%	9.9%	6.5%
United States	448,238	898,797	12.4%	9.1%	5.6%
China	84,940	761,953	2.4%	7.7%	18.4%
Japan	339,500	593,520	9.5%	6.0%	4.4%
France	231,451	434,425	6.5%	4.4%	5.0%
United Kingdom	190,481	384,365	5.3%	3.9%	5.5%
Italy	178,349	372,324	5.0%	3.8%	5.8%
Canada	132,062	356,434	3.7%	3.6%	7.9%
Belgium	123,131	334,106	3.4%	3.4%	8.0%
Netherlands	139,919	319,889	3.9%	3.2%	6.6%
World	3,569,716	9,848,878	100.0%	100.0%	8.1%

Source: authors' calculations using WITS

The rise of China's exports has disproportionately been in high-technology industries. Where fifteen years ago China was specialized in the exports of low-tech products such as apparel, toys and footwear, today it has become a key exporter of high-technology products such as electronics. This has raised concerns that China is rapidly moving up the technology ladder and becoming competitive in industries that have traditionally been comparative advantage sectors for Western economies.

We can find seemingly compelling evidence of this upgrading pattern by disaggregating China's exports according to their technological intensity.⁴ As Table 2 illustrates, China's export growth has primarily been in the two highest technology categories. Between 1992 and 2005, China's medium-high-technology exports grew 22 percent per year, while high-technology exports grew an even more impressive 32 percent per year.⁵ The combined share of the two highest technology categories in total exports has thus grown from 23.5 percent in 1992 to a staggering 53.7 percent in 2005.

⁴ In this part, we rely on the OECD's classification of manufacturing sectors into four technological categories: high-technology industries, medium-high-technology industries, medium-low-technology industries and low-technology industries (Hatzichronoglou, 1997).

⁵ High-technology industries include aerospace, pharmaceuticals, office and computing machinery, radio, TV and communication equipment and medical, precision and optical instruments.

Table 2: China's Exports by Technological Level

	Exports (US\$ mil.)		Export share		Growth rate	RCA index	
	1992	2005	1992	2005	1992-2005	1992	2005
High Tech	5,972	230,889	7.0%	30.3%	32%	0.53	1.64
Med-high Tech	14,053	178,568	16.5%	23.4%	22%	0.42	0.67
Med-low Tech	16,455	144,807	19.4%	19.0%	18%	1.17	1.07
Low Tech	36,902	178,909	43.4%	23.5%	13%	2.05	1.56
Non-manufacturing	11,558	28,827	13.6%	3.8%	7%	1.38	0.44
Total	84,940	761,999	100%	100%	18%	1.00	1.00

Source: authors' calculations using WITS

The high growth rate of high-technology and medium-high-technology exports has made China more specialized in these categories than one would expect from a developing country. Revealed comparative advantage (RCA) indices are generally used to assess the type of exports that a country specializes in.⁶ A value that exceeds (is smaller than) unity implies that the country has a greater (smaller) share of exports in that industry than the rest of the world. Table 2 shows that China in 1992 had a specialization pattern that was consistent with its level of development. Specifically, it had a revealed comparative advantage in the two lower tech categories, while it has a revealed comparative disadvantage in the two higher tech categories. In 2005, however, China not only had a revealed comparative advantage in low-tech and medium-low-tech products, but had also garnered a strong comparative advantage in high-technology products. This provides a strong indication that China has rapidly upgraded its export activities in the last 15 years.

In line with this observation, recent academic studies have used export data to estimate the sophistication level of China's exports relative to the rest of the world. Rodrik (2006), Hausmann *et al.* (2007) and Schott (2008) all highlighted the surprising resemblance between China's export pattern and that of high income countries. Rodrik (2006) found that the composition of goods that China exports is similar in sophistication to exports of countries with income levels three times higher than that of China. This has led the author to conclude that "China has somehow managed to latch on to advanced, high productivity products that one would not normally expect a poor, labor abundant country like China to produce, let alone export." Using a similar logic, Schott (2008) has used Finger and Kreinin's (1979) export similarity index to demonstrate that China's exports are surprisingly similar to the export structure of OECD countries. The author concluded that "China's export bundle increasingly overlaps with that of more developed countries, rendering it more sophisticated than countries with similar endowments."

⁶ The revealed comparative advantage (RCA) index is generally calculated as an industry *i*'s share of country *c*'s exports divided by its share of world exports (Balassa 1965).

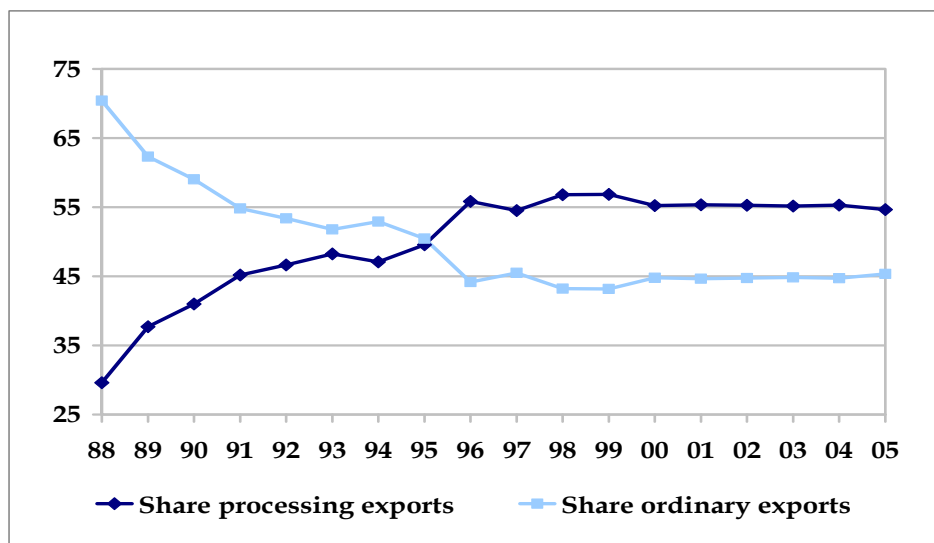
In summary, traditional measures of international competitiveness provide seemingly compelling evidence that China is not only raising its overall international competitiveness, but it is primarily doing so in high-technology industries. As a result, they seem to be rapidly upgrading their export activities and appear to have a sophistication level that is much higher than one would expect from its level of development. But how reliable is this evidence? In the following section, we will demonstrate that it is to a large extent a statistical mirage due to the role of export-processing trade in China's external trade.

3. Reassessing the Evidence

A particular characteristic of China's exports is the large importance of export processing trade. Since China's Opening Up in 1979, China has set up a number of export-processing zones along China's coastal region to attract foreign investment and technology transfers. As many companies from North America, the European Union, Japan and the Newly Industrialized Economies (Singapore, the Republic of Korea, Hong Kong and Taiwan) moved their labor-intensive assembly plants to China in a bid to cut production cost, this has led to a rapid rise in China's export-processing trade (Naughton, 2007).

The growing role of export-processing trade in China's external trade is shown in Figure 1. Between 1988 and 2005, the share of processing exports in China's total exports has risen from 30 percent to 55 percent. In other words, more than half of China's export value in 2005 corresponds to that of imported inputs that are merely assembled in China.

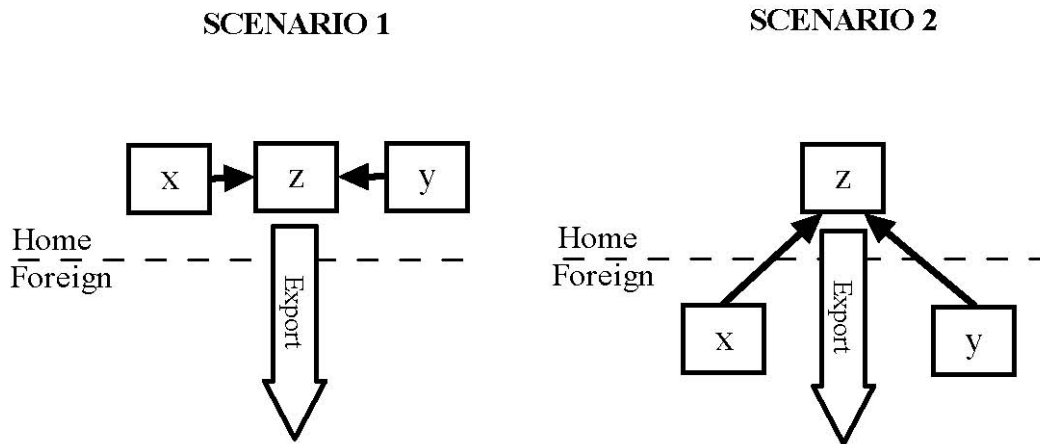
Figure 1: Processing Export Share in China's Total Export (1988-2005)



Source: authors' calculations using China Customs Statistics

The large role of export-processing trade may have significantly biased upward the perceived competitive threat from China. International trade data are generally collected and reported as gross flows rather than as value added created in the exporting country. As a result, a country's exports do not necessarily reflect accurately the production activities that take place in the exporting country. To illustrate this, consider two countries *Home* and *Foreign* and an export good z that is produced through the assembly of inputs x and y . In Figure 2, we depict two scenarios. In scenario 1, the production of the inputs x and y and the final assembly of product z all occur at *Home*. As a result, the export value $x+y+z$ accurately reflects the value created in *Home*. In scenario 2, the inputs x and y are imported from *Foreign*, while only the final assembly occurs at *Home*. The export value $x+y+z$ thus exceeds the value z created at *Home*. This implies that the export value overestimates the domestically created value in its export sector.

Figure 2: Problem with Export Data



Due to the large role of export-processing trade in China's total trade, more than half of China's exports correspond to Scenario 2. For these processing exports, a significant share of their value is that of the imported inputs embodied in these exports. Indeed, as is shown in column 2 of Table 3, only thirty four percent of the value of China's processing exports in 2005 was domestic content, while the other two thirds corresponded to the value of the imported inputs.

Table 3: Unadjusted versus Adjusted Exports

Year	Share of domestic content in export processing (%) ⁷	Adjusted Exports ⁸ (US\$ million)	Unadjusted Exports ⁹ (US\$ million)	Adjusted exports as a share of unadjusted exports (%)
1990	26.28	43,337	62,091	69.80
1995	20.83	90,421	148,780	60.77
2000	32.74	156,659	249,240	62.85
2005	34.20	487,973	761,999	64.04

Source: authors' calculations using China Customs Statistics

To more accurately estimate China's international competitiveness, it is instructive to calculate China's "Adjusted Exports" by subtracting processing imports from its total export value. In Table 3, a comparison of "Unadjusted Exports" and "Adjusted Exports" shows that China's unadjusted exports *significantly* exceed the value created in China's export sector. In 2005, for example, "Adjusted Exports" was only 64 percent of China's "Unadjusted Exports".

China's world export share also becomes less pronounced once "adjusted exports" are used. In Figure 3, we plot the share of China's adjusted and unadjusted exports in world exports. The Figure shows that the difference between both has risen to almost 3 percent. In 2005, China's adjusted share of world exports was 4.9 percent, which is significantly less than its 7.7 percent when unadjusted exports are used.

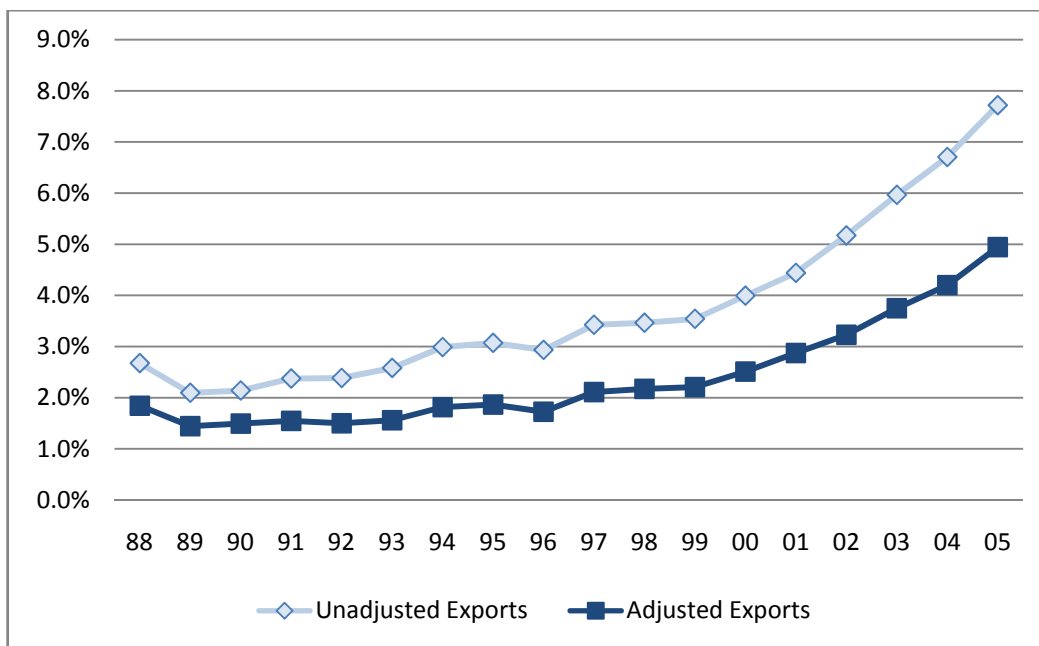
Processing exports not only biases upward China's perceived *quantitative threat*, but also distorts China's perceived *qualitative threat*. In Figure 4, we depict the share of processing exports in each technological category. Interestingly, the share is significantly higher in the high-technology categories than in the low-technology categories. Specifically, in the high-tech category, it consistently amounts to approximately 90 percent of total high-tech exports, whereas in the medium-high-tech category it has hovered around 50 percent. In the medium-low and low-tech categories, it has dropped to 40 and 30 percent respectively.

⁷ $(\text{Processing exports} - \text{processing imports}) / \text{processing exports}$.

⁸ $\text{Ordinary exports} + \text{processing exports} - \text{processing imports}$.

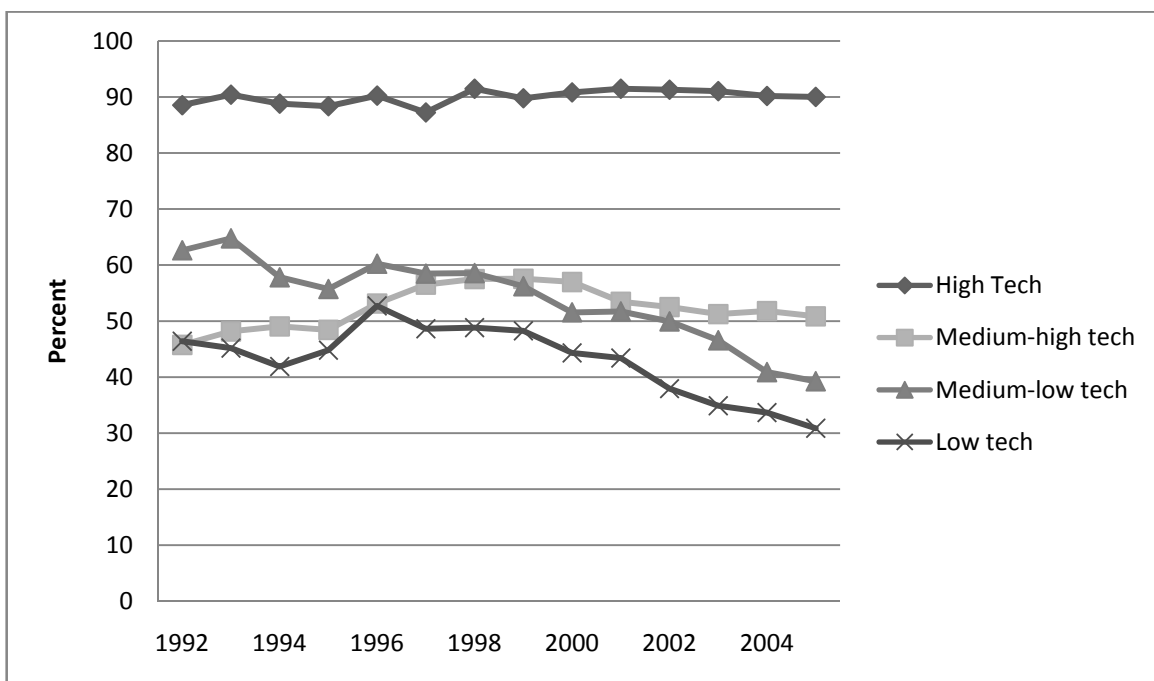
⁹ $\text{Ordinary exports} + \text{processing exports}$

Figure 3: China's Adjusted Share of World Exports (1988-2005)



Source: authors' calculations using China Customs Statistics

Figure 4: Processing Share in Total Exports by Technological Level (1992-2005)



Source: authors' calculations using China Customs Statistics data

The larger share of processing exports in the higher technology categories suggests that China's perceived upgrading trajectory is merely a statistical mirage. Indeed, since the share of export value created domestically is smaller in the higher technology categories, the upward bias is particularly severe in these high-technology categories.

To obtain a more accurate estimate of the sophistication of China's export activities, it is instructive to exclude processing exports from China's total exports, i.e. to focus on China's ordinary exports. In Table 4, we have disaggregated China's ordinary exports according to their technological intensity. The Table shows that for China's ordinary exports, there is little evidence that China is rapidly moving up the technological ladder. In both 1992 and 2005, China had a revealed comparative advantage in the two lowest technology categories and a revealed comparative disadvantage in the two highest technology categories.

Table 4: China's Ordinary Exports by Technological Level

	Ordinary Exports (US\$ mil.)		Export share		Growth rate	RCA index	
	1992	2005	1992	2005	1992-2005	1992	2005
High Tech	684	23,057	1.5%	6.7%	31%	0.10	0.36
Med-high Tech	7,626	87,773	16.8%	25.4%	21%	0.48	0.75
Med-low Tech	6,147	87,958	13.6%	25.5%	23%	0.78	1.41
Low Tech	19,773	123,704	43.6%	35.8%	15%	2.46	2.78
Non-manufacturing	11,102	23,025	24.5%	8.3%	8%	1.62	0.50
Total	45,333	345,518	100%	100%	17%	1.00	1.00

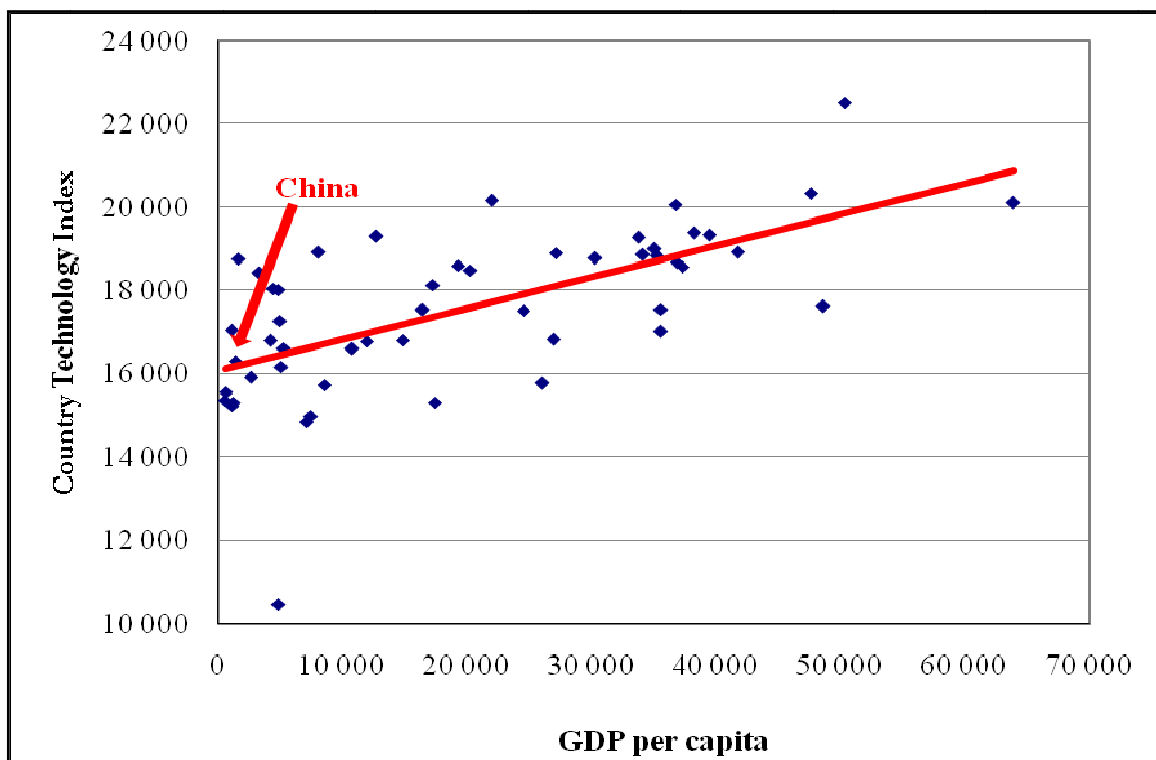
Source: authors' calculations using China Customs Statistics data

In summary, our analysis has demonstrated that there are significant problems with using export data to measure the sophistication of a country's production activities when its trade is dominated by export-processing trade. In the case of China, we have shown that it leads to a significant upward bias in China's estimated sophistication. In a recent paper, Van Assche and Gangnes (2008) have delved deeper into this issue by using electronics production data to estimate China's upgrading trajectory vis-à-vis the rest of the world. While these two studies have the limitation that they focus solely on the electronics industry, their use of production data instead of trade data allows them to more accurately capture the type and magnitude of production activities that take place in a country. Interestingly, Van Assche and Gangnes (2008) find that when electronics production data are used instead of trade data, the evidence that China's level of technological

sophistication in electronics is higher than one would expect for its level of development completely disappears (Figure 6).¹⁰

Before discussing the policy implications of our analysis, it is important to highlight a *caveat* to our results. Our analysis does not suggest that China is not gaining international competitiveness or that it is not upgrading its production activities. Rather, we make the more subtle point that the “miracle” aspect of China’s exploding exports is smaller than is generally portrayed. In other words, while there is evidence that China’s production activities are upgrading and that the presence of foreign firms in China are generating positive knowledge spillovers to local firms (Abraham *et al.*, 2007), their upgrading pattern does not stand out from that of other developing countries.

Figure 5: Relationship between Per-capita GDP and Sophistication of Electronics Exports (2003-2005)



Source: Van Assche and Gangnes (2007)

¹⁰ Our conclusion is further strengthened by recent studies that compare the quality of countries’ export products by looking at their unit values. Schott (2007) found that the prices that U.S. consumers are willing to pay for China’s exports are substantially lower than the prices they are willing to pay for OECD exports. This suggests that competition between China and the world’s most developed economies may be less direct than their product-mix overlap implies. Fontagné *et al.* (2008) and Monfort *et al.* (2008) find similar results for the European and Belgian markets respectively.

4. Implications

This paper has highlighted that standard measures of international competitiveness can create severe biases in a world where value chains are dispersed across multiple countries. Indeed, we have demonstrated that due to the large role of processing exports in China's total exports, this has led to an exaggeration of both the quantitative and qualitative threats that are perceived to come from China.

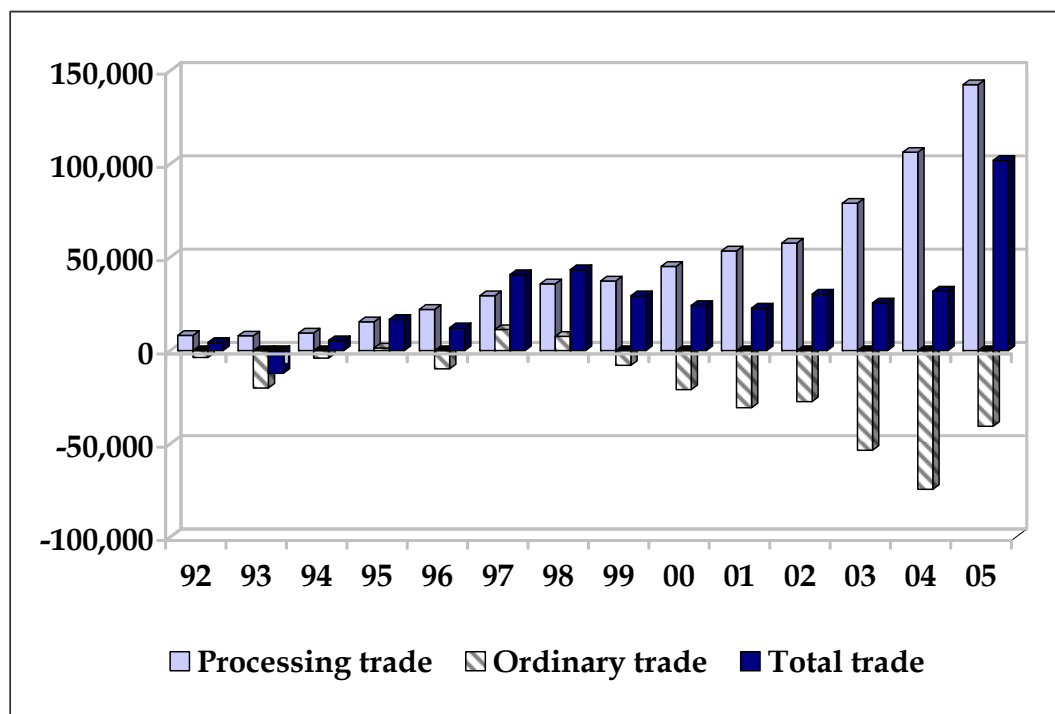
In our view, the source of the problem lies deeper than in the measures of international competitiveness. Rather, it lies in the mindset that many policy makers, journalists and academics have when thinking about international trade issues. Despite the dramatic expansion of value chains across multiple countries, many people continue to consider a country's exports to be entirely produced in the exporting country. In the remainder of this section, we will give two examples how this flawed mindset can lead to important misinterpretations of economic reality, and potentially even to inadequate policy responses. We will then finalize this section with an example how the globalization of value chains requires governments to rethink and adapt their trade policies.

4.1. U.S. Bilateral Trade Deficit against China

Between 1996 and 2006, the U.S. current account deficit has expanded from US\$125 billion to US\$812 billion. Many U.S. policy makers have attributed this trend to the burgeoning bilateral trade deficit that the U.S. has vis-à-vis China. But is China really responsible for the bilateral trade deficit?

In Figure 6 we disaggregate China's trade balance against the world into a processing trade balance and an ordinary trade balance. From the Figure, it is clear that China's trade surplus is solely driven by an exponentially growing surplus in processing trade. Indeed, China's ordinary imports have consistently exceeded China's ordinary exports since 1999.

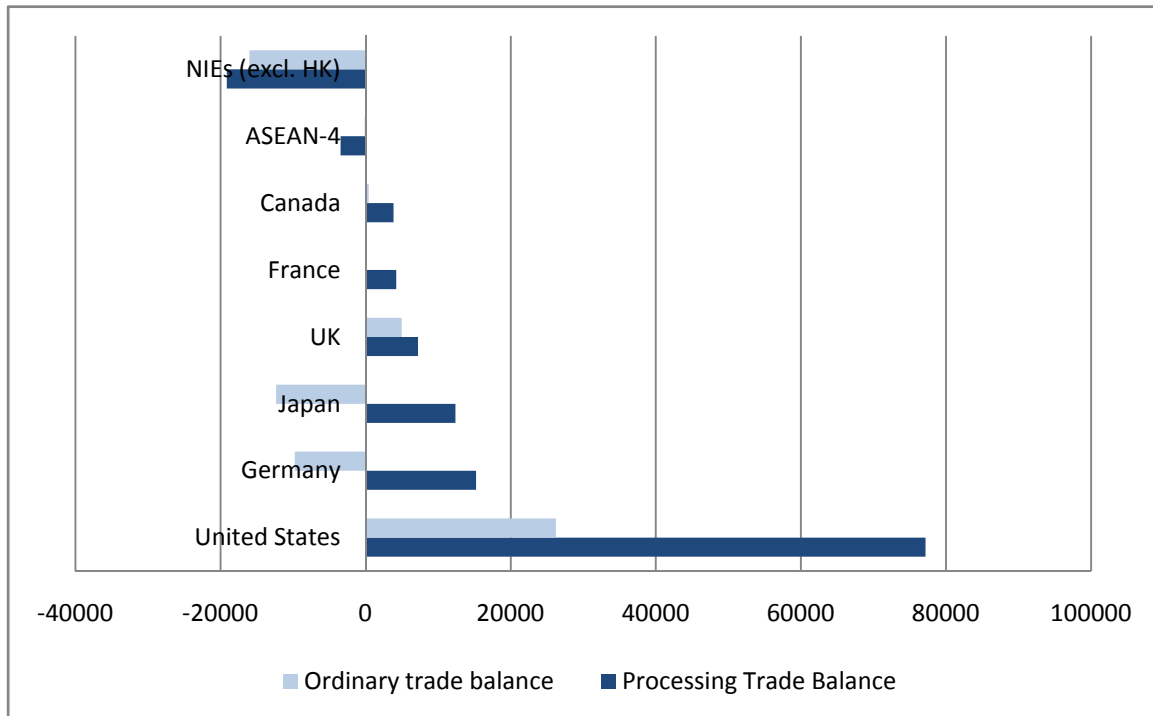
Figure 6: China's Trade Balance for Processing Trade versus Ordinary Trade, 1992-2005 (US\$ million)



Source: authors' calculations using China Customs Statistics

In Figure 7, we depict China's bilateral trade balances with a number of key Western and Asian countries in 2005. The figure shows that China has a processing trade surplus with high-income countries (the United States, Germany, Japan, the United Kingdom, France and Canada), while it has a processing trade deficit with its developing East Asian neighbors. If we take the patterns of Figures 6 and 7 together, it suggests that China has turned into a global assembly platform that sources its processing inputs from its East Asian neighbors while sending its final goods to high-income countries. Since China is often only responsible for the final assembly of its export products, this puts into question China's responsibility for the growing U.S. trade deficit.

Figure 7: China's Bilateral Trade Balance for Processing Trade versus Ordinary Trade, 2005 (US\$ million)



Source: authors' calculations using China Customs Statistics

4.2 “Made in China”: What's in a Label?

After last summer's toy recalls, many people have been wary of purchasing products with the label “Made in China”. As the recent book by Sara Bongiorni “A Year without Made in China: One Family's True Life Adventure in the Global Economy” points out, however, products labeled “Made in China” are omnipresent and living without them is a sheer impossibility. But does a “Made in China” label really mean that a product was made in China?

Canadian and U.S. customs require that all imported products be marked with the name of a foreign country of origin and that the marking be present when the end consumer purchases the products. However, figuring out the country of origin of a product is not as simple as one might think in a world with global value chains. The origin is straightforward when the entire production process of a product is located in a single country. When the production process of a good is dispersed across multiple countries, however, the origin of traded goods becomes ambiguous. In that case, the country of origin of a good is generally determined by the last country in which a `substantial

transformation' of the good took place. A good undergoes a substantial transformation if, as a result of manufacturing and processing steps in this country, the imported good loses its identity and is transformed into a new good having a new name, character, or use.

A direct implication of the substantial transformation tests is that countries such as China that specialize in final assembly will disproportionately receive a “country of origin” label, even if only a fraction of the product’s value is produced in that country. Take the example of the Apple video iPod. The video iPod is labeled “Made in China” despite the fact that it combines components and technologies from numerous countries. As can be seen from Table 5, the key components from the video iPod are made in the U.S., Japan, Korea, Taiwan, Singapore and China.

Table 5: Manufacturing Location of Key Components of the Apple Video iPod

Component	Supplier	Headquarter Location	Manufacturing Location
Design	Apple	US	US
Portal Player CPU	PortalPlayer	US	US /Taiwan
Video/multimedia processor	Broadcom	US	Taiwan/ Singapore
Mobile SDRAM memory	Samsung	Korea	Korea
Display driver	Renesas	Japan	Japan
Display module	Toshiba-Matsushita	Japan	Japan
Hard drive	Toshiba	Japan	China
Insertion, test and assembly	Inventec	Taiwan	China

Source: Linden et al. (2007)

4.3 Trade Policy

The globalization of value chains requires many governments to rethink and adapt their trade policies. The complexity of the issue was highlighted in a recent European anti-dumping case regarding energy-efficient light bulbs originating in China, in which one European interest was put against another ([EurActiv 30/08/07](#)). On one side, Germany's national light-bulb manufacturer Osram, which produces most of its light bulbs in Europe, called for a prolonging of the anti-dumping duties for five extra years. On the other side, the other three major EU producers, Philips, General Electric and Sylvania, opposed the extension of the duties. The Dutch electronics giant Philips, for example, offshores a major part of its light-bulbs production to mainland China, and is therefore liable to paying anti-dumping duties which reach up to 20 million euro a year.

The European Commission has often struggled to balance the interests of Europe's importers and retailers, who increasingly rely on cheap inputs and goods from Asia, and those of local manufacturers who regularly accuse China and other countries of breaking

trade rules. Yet, the question of “Community interest” faces an additional dimension in the light-bulbs case, in the sense that EU companies are now also producing in low-cost countries, and not simply importing inputs. This case shows trade is not anymore a simple game between countries, but rather the interplay between companies with production facilities across the globe. As a delicate compromise, the European Commission decided to delay the end of the anti-dumping duties with one year to allow firms adjusting their production patterns and adapting to the new market conditions.

5. Conclusion

In this paper, we have demonstrated that China’s rise in international competitiveness is less severe once we take into account the problems related to trade data. First, one third of China’s export value is attributable to imported inputs, thus significantly biasing upward China’s export performance. Indeed, if we only account for China’s exports that were produced domestically, China’s exports drop to 60 percent of its original value. Second, once we take into account the role of processing trade, there is no evidence that China is more rapidly upgrading into more high-tech production activities than expected from its level of development. China continues to have a comparative advantage in low-technology activities and a comparative disadvantage in high-technology activities.

The implications are quite profound. Many policy makers proclaim that we should protect our comparative advantage industries against China’s unfair competition. Our findings suggest that following up on these suggestions might lead us to keep our eyes off the ball. In line with international trade theory, our direct competitors in the tasks that we have a comparative advantage are not located in China, but continue to be the usual suspects: the United States, Western Europe and a handful of High-Income East Asian economies. Besides, the possibility of offshoring the more labor-intensive production and assembly activities to China provides an opportunity to our own companies to survive and grow in an increasingly competitive environment. It is likely that over time, China will catch up to the elitist group, but they are not there yet and there is no indication that they will be there in the near future.

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